Availability

Definitions

- **Reliability** is the probability (likelihood) an item will perform its intended function (mission) with no failures during a specified period of time (mission time) under specified conditions (environment).
- **Maintainability** is the probability that a failed item will be restored or repaired to a specified condition within a period of time.
- As a function of reliability and maintainability (R&M), **Availability** is the probability that a repairable system will perform its intended function at a given point in time or over a specified period of time when operated and maintained in a prescribed manner.
- Note: It is availability and not reliability that addresses downtime (e.g., time for maintenance, repair, and replacement activities). It is important to determine if the management question or system requirement is limited to reliability or if it pertains to availability.

Types of Availability

- As with reliability, availability can be either a demonstrated or predictive (forecasted) measure of performance.
- **Demonstrated availability** is (uptime) / (uptime + downtime).
- In regards to the level of detail used to describe downtime, **predictive availability** has three types:
  - Inherent availability
  - Achieved availability
  - Operational availability
- In regards to time and the mission, **predictive availability** has three types:
  - Point (instantaneous) availability at time t.
  - Interval (average) availability during the time period from t_1 to t_2.
  - Steady-state (asymptotic) availability for the long run as $t \rightarrow \infty$. Steady-state availability for a non-repairable item is equal to zero.
- **Inherent availability** is based solely on the failure distribution (reliability math model) and the repair distribution (maintainability math model)--and inherent availability is an important system design parameter for trade studies.